(54) Title: METHOD AND APPARATUS FOR KEEPING A CHECK ON THE STORAGE TIME FOR GOODS IN A STORAGE
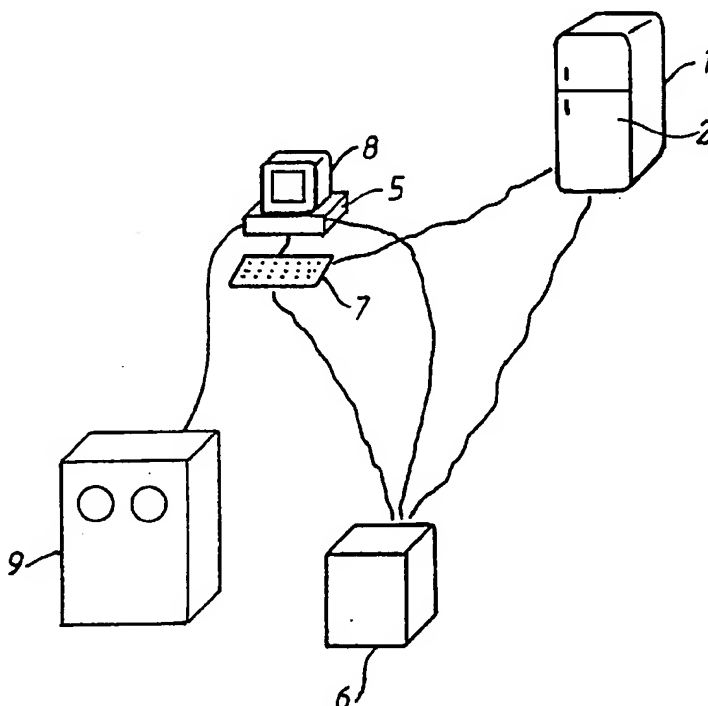
(57) Abstract: The invention refers to a method and an apparatus for registering and supervision of the positions and time of storage of articles entered into a cabinet or other delimited space. A preferred fields of application is refrigerators in which one or several cameras (3) at selected occasions take pictures of the interior of the refrigerator (1). These pictures are treated in an image analyser (6) which transfers clear pictures of all articles stored on each shelf (4) in the refrigerator (1) to a computer (5) for registration. In the computer (5) there is stored for each article information on the time of entry in a list containing article denominations. For distance communication the computer (5) can be connected to a central computer (9) having information about all articles marketed on a national basis and including both pictures and denominations. It is possible to establish a remote connection, via Internet or via mobile phone, to the computer (5) for collecting information on the content of the cabinet, for example when shopping in a store.

WO 02/15073 A1

Method and apparatus for keeping a check on the storage time
for goods in a storage

The present invention refers to a method for recording
the position of goods stored in a cabinet or other space, in
particular food-stuffs stored in a refrigerator, and for
supervision of the storage time thereof. For carrying out the
5   method an apparatus, suitable therefore, has been invented.

In SE-A-9900582-9 a cabinet is described which includes
one or several built-in cameras for taking pictures of the
content of the cabinet and transferring the pictures to an
image analyser. A number of pictures taken at different
10   occasions are put together by the image analyser which by
means of an associated computer makes lists of the content of
the cabinet and, by means of a data program, of what to
replenish. If the cabinet contains food-stuffs no information
on the age thereof or on which food-stuffs have to be
15   consumed first can be obtained by the known arrangement.

From practical use it has appeared that a refrigerator
is loaded with food-stuff items to such degree that not even
with the aid of the mirrors mentioned in the patent
application referred to pictures are obtained by means of
20   which all items will certainly be identified. Investigations
have proved that in a household up to 10.000 articles can
exist and surprisingly many of these are stored in a
refrigerator. Equipment which offers a complete distance
communication in terms of a mobile phone connection from a
25   store to a home computer in order to obtain information on
articles to shop, of course, also has to include a cabinet
for groceries. Accordingly, an image analyser can be needed
which has the capacity of a computer for identification of
the 10.000 articles indicated. In itself, this is a question
30   of dimension and of the number of cameras to be used.
However, the problem remains to identify an article from
fragmentary partial pictures only of said article or its
package for recognizable illustration, for example through a
picture or, alternatively, a denomination, transferred via

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Internet to a shop computer.

Another problem to which, hitherto, the prior art has
not offered any solution is to automatically keep a check on
the age of perishables, for example stored in a refrigerator,
5   in other words the "best-before-date", actually the "usable-
up-to-date". In the known arrangement, in which pictures are
taken every time the refrigerator door is opened, or with a
different selected frequency, one is reduced to using the
conventional method. As known, this involves a "best-before-
10   date" printed onto a food-stuff package or manually written
thereon. In connection with home-made provisions or left-
overs more frequently a making or packing date is noted on an
adhesive label. In both cases it is required that the article
be removed from the storage cabinet for reading of the date
15   indicated thereon.

Inter alia fresh fruit and vegetables, offered for sale
loose by the weight by self-service, do not naturally bear
any indication of recommended time of consumption. In case of
a desire of providing a refrigerator with an automatic
20   warning device indicating the presence therein of eatables no
longer fit for consumption one is reduced to the use of
devices usually referred to as electronic noses. Such devices
cannot sense smell in human meaning but detect the presence
of putrefactive gases, such as methane, hydrogen sulfide and
25   amines, and in the most developed forms also pheromones.
However, these devices are disqualified for domestic use
because they are too expensive. In addition, the effect
thereof comes too late when putrefaction has already started.
Also, the devices cannot single out a specific article for
30   which the date of consumption has expired.

The object of the invention is to bridge the weaknesses
associated with the present system as far as keeping a check
on specific articles and the storage time thereof in a space
are concerned. The apparatus invented for carrying out the
35   new method is capable of identifying articles, recording the
time of placement thereof in a storage space, such as a

cabinet, and of indicating, in good time before the
expiration of the time of consumption thereof, that the
specific article should be consumed in the immediate future.
In case of eatables the arrangement can also submit recipes
5 in which the specific eatable, in the amount available, is
contained.

     The characteristic features required for carrying out
the new method appears from the appending claims as do those
for the invented apparatus.

10   For carrying out the method the apparatus includes the
following components:
cameras, suitably with a picture size and in a number so as
to cover every partial space of the room or cabinet to be
supervised

15 a local computer with a program for recognition of articles
reproduced on pictures transferred by the cameras to an image
analyser, the computer in a practical case, from a functional
point of view, being split into separate units;
preferably, also communication means for connection with a

20 central computer in which identities for all articles offered
for sale on a national basis are recorded, said central
computer in certain cases being adapted only to transfer the
picture whereas the analysis is performed by the central
computer.

25   The local computer, i.e. the computer provided adjacent
the room which is supervised, the cabinet or cabinets can be
connected to a keyboard and to a monitor or to a voice-
controlled communication system. In certain cases a mobile
phone or an Internet-connected equipment can be used. In a

30 suitable place in the cabinet or room an area or a shelf is
provided in which when introduced into the space articles can
be placed for identification by means of a bar code reader or
a RFID-reader or for recording of new articles by means of
voice communication. This equipment is intended to be used in

35 case neither the local computer nor the central computer,
consulted via an Internet connection, can recognize an

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article. Such a case may occur if the article has been
purchased during a trip abroad or if it has been imported. If
the article is packed and provided with a bar code the
central computer should be able to identify the article and

5   if it fails the user has to enter the denomination of the
article in the local computer by means of the keyboard or by
means of the voice.

Alternatively, the article is given a running number and
a denomination which both are recorded together with a

10 picture of the article taken by a camera. The time of
recording is stored. In case of an article with limited
tenability the "best-before-date" is also recorded in the
computer or taken from a register for the corresponding type
of goods.

15   In case of RFID-marking a corresponding recording method
has to be used.

The invention can be applied in connection with storage
spaces of all kinds from wholesale dealer stores to household
medicine cabinets. In the first-mentioned case the invention

20 can serve as a means for maximum degree of packing as pallets
with a specific article do not require a determined place in
a stand but can be placed anywhere there is an empty
compartment. Accordingly, the same type of articles can
appear in several different places in the store; the computer

25 keeps a check on where and on which pallet loads in the store
are the oldest.

Another area of application can arise when shops in
sparsely built-up areas shall serve also as a post office
replacement. In most cases the additional business will be

30 required to be housed in the space already provided. As far
as the post packages are concerned they have to be stored in
a very compact way from arrival to delivery. The possibility
of using every square decimeter of the storage shelves
provided will become even more a necessity with increasing e-

35 shopping and mail-order business.

The major use of the invention, as counted in separate

installations, is assumed to apply to private households, in particular relating to refrigerators and freezers, however not excluding refrigerating and freezing rooms in connection with professional kitchens.

5   Below, the method will be described in connection with the use of the apparatus for a domestic refrigerator. This shall be taken as an example only which should not be interpreted as a limitation of the inventive idea whatsoever. Reference is made to the appending drawing, in which:

10   Fig. 1 illustrates the schematic component assembly of the apparatus;
Fig. 2 shows a refrigerator equipped for carrying out the method;
Fig. 3 shows an enlarged view of a shelf shown in fig. 2 and
15   used for separate identification of articles, and
Fig. 4 schematically shows the principle of finding and identifying a hidden article.

        A refrigerator 1 having one or several doors 2 is provided with one or several cameras 3. The number of cameras
20   is chosen in dependence on the number of partial spaces in the refrigerator, i.e. the number of shelves 4 that are provided. The cameras are provided with wide angle lenses and are adapted to take digital colour pictures which are transferred to a local computer 5 connected to an image
25   analyser 6, said transfer taking place via a fixed line or via radio link, for example by use of so-called bluetooth technique. Suitably, the computer 5 is equipped with a keyboard 7 and/or means for voice communication, and a monitor 8. The computer can also be connected to a central
30   computer 9 via a fixed line, Internet or a radio link. Preferably, the central computer can be located at the company that provides the apparatus (white goods dealer or a company offering E-shopping). It should be mentioned that the local computer does not need to be a physically separate unit
35   but could be part of the central computer.
        In the central computer 9 all article identities are

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stored, if applicable recorded by means of bar codes or
information stored on magnetic strips of RFID-type.
Vegetables and fruit, for example, which appear unpacked in
the store, are stored in the form of colour pictures as are
5   articles without identifying characteristics as referred to
above. All packed articles are supplementary registered as
colour pictures for reasons given below.

In performing the method the following operations are
applicable. Articles from the shop are put in the
10 refrigerator 1 and the door 2 is closed. By means of a delay
function the refrigerator light remains on during a minute or
so and during that time pictures are taken by the cameras of
the articles on all shelves.

In an apparatus having cameras 3 mounted in the door 2,
15 alternatively, the cameras take one or several pictures at
different angles during the turning movement of the door in
the angular area from 90° to a position where the door is
closed. On the monitor 8 the computer 5 can automatically
show pictures of the articles put in the refrigerator, shelf
20 by shelf or the user must effect this stepping of the
pictures by means of the computer keyboard 7 or by means of
voice control. As far as in the computer 5 pictures have been
recorded for all articles put into the refrigerator 1 at this
occasion nothing happens. However, in case the computer
25 should not recognize certain articles these will be shown on
the monitor 8, for example marked in a differing colour or
stronger illuminated. In that case the user can connect the
local computer 5 with the central computer 9 ans ask for the
article identities. On the assumption that the central
30 computer 9 can identify the articles their identities are
transferred to the local computer 5 and recorded therein for
future use, both as a picture and a denomination.

In case the central computer 9 does not recognize an
article put into the refrigerator 1 this article will be
35 shown on the monitor 8 with a surrounding frame or in another
way clearly marked, for example in a list of articles. This

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is an invitation to the user to put the article concerned in
an area specifically marked or on a particular shelf 10
provided in the refrigerator. Adjacent the shelf 10 one or
several mirrors 11 are provided which reproduce also the back

5 and bottom sides of the article in the pictures taken by the
cameras 3. The article is depicted by at least two cameras 3.
If the article is recognized by the local computer 3 or the
central computer 9 when more than one projection thereof is
available the user can press the ENTER-key 7 on the keyboard

10 and registration in the local computer 5 is completed. In
case none of the computers recognizes the article the user
must enter the denomination of the article by means of the
keyboard 7 or by means of voice control and the denomination
is then recorded in the local computer together with pictures

15 of the article.

Preferably, the shelf 10 is made of transparent
material, such as clear glass. In refrigerators having glass
shelves or bar shelves no particular shelf 10 is required but
a marked area on a regular shelf can be used for the purpose

20 indicated. In a freezer, however, having shelves formed by
cooling elements as well as in cabinets for groceries with
shelves made from solid wood or of fibre material a shelf 10
of transparent material is required. The reason for this is
that one camera 3 depicts an article from above and another

25 one from below through the shelf 10. Another advantage is
that in the shelf 10 a load sensor can be provided which is
connected to the two cameras taking pictures causing them to
readjust focus so that sharp pictures are obtained of the new
article. Advantageously, each shelf can be provided with a

30 load sensor. These sensors and associated pictures of the
shelf concerned can indicate if an additional article has
been added or, in case of reduced weight and the image memory
of the computer does not indicate any change of the number of
articles or their identity, if in a package a certain

35 quantity has been removed. If the computer can determine that
any package has been disarranged the computer records that

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part of its content has been consumed.

In use of the method in a warehouse environment it is
assumed that pallets or cardboard boxes or the like piled on
pallets are marked by means of bar code labels. Each pallet
5   position is equipped with a load sensor which upon a change
(increase or decrease) of the load activates a camera,
suitably situated on an opposite stand. The latest picture
taken is stored in the computer and, accordingly, the
computer can signal when the ordering point for the article
10 concerned has been reached.

In the case of a post office the method is carried out
in a similar way. Arriving parcels are placed in any free
position in the available shelf compartments. Then, pictures
are taken of the shelves by a sufficient number of cameras.
15 The identities of the parcels are represented by bar code
labels turned outwards. On the parcel dispatch note an
identical bar code has been printed. Upon collection the
latter bar code is read by a bar code reader connected to a
local computer. The computer provides an indication of a
20 shelf compartment making possible for the serving officer to
find the parcel in question. If for some reason the parcel
has arrived in the wrong collecting place, by means of the
local computer a question can be directed to a central
computer for the place of this parcel. In that way, by means
25 of the local computer the parcel can be ordered from the
erroneous collecting place.

In order to facilitate the supervision by the apparatus
of for example the degree of freshness of food in a
refrigerator a virtual system of coordinates is provided in
30 the local computer. This means that the position of an
article in the refrigerator is known by the computer 5. As
regards packed food not completely consumed at one occasion
but returned into the refrigerator for example after a meal,
the computer can react in any of a few different ways. If the
35 food is packed in a transparent vessel, e.g. sliced cucumber
in a jar, the computer 5 can note that the volume of the food

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in the jar has decreased. In case of beverages packed in a
non-transparent package (e.g. milk in carton pack) the
computer assumes that a certain volume has been consumed.
This is shown on the monitor 8 by giving the package a
5 different colour or by indicating in the content list the
number of times the package has left the refrigerator.
    Due to the fact that changes of the content of the
cabinet 1 can only take place when the cabinet door is open
it is sufficient that pictures are taken by the cameras 3
10 every time the cabinet door is being closed. The latest
pictures are compared to those taken immediately before and
the computer 5 records the changes. In order to cover also
the meal case when a milk package has been taken out from the
refrigerator 1 before the meal, and after this withdrawal is
15 considered as non-existent but after the meal is returned to
the refrigerator, the computer 5 compares the two latest
pictures with the to pictures taken immediately before. The
computer program assumes that a certain volume of milk has
been consumed at this occasion and if a shopping list is
20 ordered from the computer, milk will be listed. If the milk
package is returned within a determined time period, for
example two hours can be programmed time, the computer
records it as the same package. If a longer time has elapsed
between the closure of the cabinet when the package was
25 returned and the closure immediately before, the computer
records the milk package as a new one. Then the computer
records a new "best-before-date". It happens, of course, that
a package is removed from the cabinet and then returned un-
opened. If the package is placed fairly on its initial place
30 within the programmed "approved" out-of-refrigerator time
nothing happens. However, if returned to a different place
the package is marked on the monitor 8 or in the list in a
differing colour. This means that the user has to confirm
that it is the same package that previously has been taken
35 from the refrigerator. In opposite case the computer will
record it as a new package of the same article and give it a

new "best-before-date".

Bearing in mind that not all shops get daily deliveries
of perishables, such as milk, and in many shops the
coordination between deliveries and sales of inter alia milk
5   is imperfect one can not trust a programmed freshness time
but in the computer a shorter time must be tied to the
specific package. As a consequence, for safety reasons the
user must himself be able to record the "best-before-date",
which can take place in two ways. Either the package is
10 placed on the shelf 10 and the camera 3 takes pictures of a
date stamp on the package which is recorded in the computer
5. Alternatively, the user records the date of the stamp
while the package on the shelf 10 is depicted by the camera
3. In the computer 5 time periods have been programmed for
15 various food-stuffs indicating to which extent the freshness
time has been shortened when these are at room temperature,
such as during a meal or when being brought home from the
shop.

The virtual system of coordinates of the computer 5 is
20 helpful in keeping a check on specific articles, in
particular those which are packed. When the milk package
referred to above is returned to the same position from which
is was taken no problem occurs. In the computer 5 a certain
tolerance value can be programmed for the case that the
25 package has been slightly displaced horizontally. Should the
package be put into the refrigerator on a different shelf as
compared to the shelf from which it was taken the computer
notes that it is an opened package and records it together
with the oldest "best-before-date" noted for milk packages in
30 the refrigerator.

If the person loading articles into the refrigerator
should put newly bought articles in front of remaining
articles of the same kind the system of coordinates will
help. If the older package remains unmoved or if it has been
35 displaced further into the refrigerator it will be displayed
on the monitor in a differing colour. Based on this

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information the user can rearrange the articles or he can
take out the package with the innermost position next time
this kind of article is to be used.

If articles are loaded in a cabinet in a closely packed
5   arrangement and pictures have been taken by the cameras it
may happen that the image analyser does not succeed in
putting together pictures such that the computer 5 recognizes
all articles. Even if the mirrors 11 complete the direct
pictures taken by the cameras 3 of the sides of the packages
10   facing the cameras and the system of coordinates of the
computer 5 assigns the mirror images to the right packages
the information to the image analyser could be insufficient
for the computer 5 to recognize certain packages. Now, the
unknown articles are shown lighter on the monitor whereby the
15   user is requested to put one article at a time on the shelf
10 for identification. After, in this way, pictures have been
taken of the articles they can be put back into the cabinet
as known by the computer 5.

Fig. 4 shall illustrate how hidden articles, preferably
20   packages, in a refrigerator are identified by the apparatus.
As an assumption, the shelves of the refrigerator are
essentially transparent, in practice meaning shelves made of
glass or in bar shape. As a result, suitably placed cameras 3
can take pictures of the undersides/bottom surfaces of the
25   packages A,B,C,D,E,F. Due to the fact that the position of
the camera 3 which takes the pictures is known, the shelf
with the package concerned will be identified. Hereby, the
bottom pictures are paired together with the correct shelf
overviews. The virtual system of coordinates serves to give
30   orientation on where on the shelf the article is placed. By
the aid thereof the apparatus then determines which package
underside belongs to the unknown article. To the extent that
the bottom side of the article is significative the article
should now be identified as the whole bottom side has been
35   depicted except for what is hidden by the bars in case of a
bar shelf.

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If there is no picture stored in the local computer 5 of the vertical sides of the article a request is sent to the central computer 9 which should be able to deliver this information.

5   The purpose of the pictures of fig. 4 is to show how the identity of the article E is obtained. Fig. 4a shows schematically a refrigerator 1 with open door 2. Adjacent to its upper edge and close to its locking side a camera 3 is provided. During the closing phase of the door 2 the camera

10 takes a picture showing the upper part of Fig. 4b. At the same time a camera 3', also disposed in the door 2 vertically below the camera 3, takes a picture. This picture is converted in the computer 5 into a orthogonal projection. As shown in the lower part of Fig. 4b the converted picture

15 corresponds well with the picture of the upper part. Accordingly, here a picture is obtained of the bottom side of the package designated E which is hidden in the upper picture of Fig. 4b. If the bottom picture of the package E should be characteristic or if it can be recognized from the preceding

20 opening the computer 5 or the central computer 9 can present a picture of the package/the article E as a whole. In case not an indication on the monitor 8 tells that on the shelf 4 there is an article which has to be placed on the shelf 10 in order to be registered in the memory of the computer 5.

25   In the situation shown in fig. 4 it is, of course, an advantage if a mirror 11 is placed behind the shelf 4. Thereby a reflected image can be obtained of one vertical side of the package E. This picture is turned right in the image analyser 6 and used together with the picture taken by

30 the camera 3'of the bottom side of the package E for the purpose of finding, for instance in the database of the central computer 9, the remaining sides of the package. Then, on the monitor 8 a picture can be displayed according to Fig. 4c or Fig. 4d.

35   The presentation of the content can follow the real arrangement in the refrigerator but it can also show groups

of articles according to the date they were first identified
or according to types of articles, e.g. vegetables, meat,
beverage, etc. In the later case, by marking in the picture,
information can be given about purchase time and last
5   consumption date.

In case a medicine compartment is contained in a
refrigerator or if a special medicine cabinet is provided it
can be supervised by the apparatus. Then, by means of the
computer clock, it is possible to control the display of
10   packages of medicines which are to be taken at a certain time
during the day so that they are marked in a differing colour.
Moreover, the number of tablets to be administrated at each
occasion can be shown above the reproduction of the
respective package on the monitor. This method can be used to
15   control that the medication is followed and, if not, to give
a suitable alarm. In the cases discussed above the articles
can of course also be presented as lists.

The apparatus can be used in connection with a plurality
of similar methods as would be apparent to the man skilled in
20   the art.

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C L A I M S

1.   A method for keeping a check on the freshness of
articles stored in a room, a cabinet, e.g. a refrigerator, or
other space, preferably food-stuffs, wherein one or several
cameras are positioned in or adjacent to the space, said
5   cameras transferring pictures of the articles to a computer
and associated image analyser, which on a monitor displays
pictures put together or lists of the content of the space,
characterized in that after the entry of articles into the
space these are identified on pictures taken by the cameras
10 in connection with a register programmed into the computer,
said articles being registered with regard to orientation and
position in the space and/or the time of entry.

2.   A method according to claim 1, **characterized** in that
identification by the computer is based upon those articles
15 present in the space at the preceding registration.

3.   A method according to claim 1 or claim 2, **characterized**
in that if an article placed in the space cannot be
identified by the computer this article is displayed on the
monitor in an overview picture in a differing colour or
20 lighter than remaining articles.

4.   A method according to any of the preceding claims,
characterized in that the computer automatically gives to
unidentified articles a unique identification which is
registered together with the pictures.

25 5.   A method according to any of the preceding claims,
characterized in that if the computer cannot directly
identify an article this article is placed on a marked place
in the space to be depicted by at least one camera, the
resulting picture or pictures being then registered in the
30 computer.

6.   A method according to any of the preceding claims,
characterized in that if the article is not provided with a
bar code it is depicted by one or several cameras of which at
least one is directed towards one or several mirrors fixedly

mounted in the space, whereby the sides of the article is
registered in the computer.

7.   A method according to any of the preceding claims,
characterized in that inputting of articles or information

5 thereof in the computer takes place by means of voice-
controlled communication.

8.   A method according to any of the preceding claims,
characterized in that a virtual system of coordinates has
been programmed into the computer making possible for correct

10 back sides of the articles to be registered together with
front sides of the articles visible to the cameras.

9.   A method according to claim 8, **characterized** in that in
a space, relatively closely packed with various articles so
that the cameras can only transfer picture fragments to the

15 computer, by means of the virtual system of coordinates the
computer can keep a check on which articles are represented
by the picture fragments.

10.   A method according to any of the preceding claims,
characterized in that when the freshness time of an article

20 is about to expire the computer gives a signal on the monitor
by showing on an overview picture the article in a framed
shape or marked in a list.

11.   A method according to claim 10, **characterized** in that on
command the computer can show recipes of dishes in which the

25 framed article is included.

12.   Apparatus for carrying out the method of claim 1,
comprising a space, preferably a cabinet (1) having at least
one door (2), one or several cameras (3) for supervising the
interior of the cabinet (1), a local and/or a central

30 computer (5) to which taken pictures are transferred by the
cameras (3) in order for the pictures to be separated by an
image analyser (6) connected to the computer (5) and the
articles present on the pictures to be identified for
registering in the computer (5), and a monitor (8) connected

35 to the computer and on which pictures of the articles or a
list can be displayed on command from a communication means

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(7) associated with the computer (5), **characterized** in that a
virtual system of coordinates is provided in the computer (5)
by means of which the orientation and place of each article
is determined, and means for registering the time of entry
5   into the space and withdrawal from same of each article.

13.   Apparatus according to claim 12, **characterized** in that
in case the computer (5) cannot identify an article entered
into the space the computer (5) can be connected to a central
computer (9) which transfers the requested identity to the
10 computer (5) to be added into the register thereof.

14.   Apparatus according to claim 12 or claim 13,
characterized in that if the information on an article
contained in a picture transferred to the image analyser (6)
from the camera (3) is insufficient for the computer (5) to
15 be able to identify the article, the visible part of the
article is shown in a differing colour in an overview picture
presented on the monitor (8).

15.   Apparatus according to any of claims 12 through 14,
characterized in that in case an article is to be entered
20 into the space which is not registered neither in the
computer (5) nor the central computer (9) a shelf (10) of
transparent material is provided towards which are directed
at least two cameras (3) which by means of mirrors fixed
mounted in the space depict the article from several sides,
25 eventually including back sides, when the article is placed
on the shelf (10).

16.   Apparatus according to any of the preceding claims,
characterized in that a thermal register for perishables is
programmed into the computer (5) according to which the
30 remaining "best-before-time" can be registered individually
and adjusted in dependence on the time the article has been
out of the temperature zone adapted for preserving freshness.

17.   Apparatus according to any of the preceding claims,
characterized in that at least one shelf is provided with one
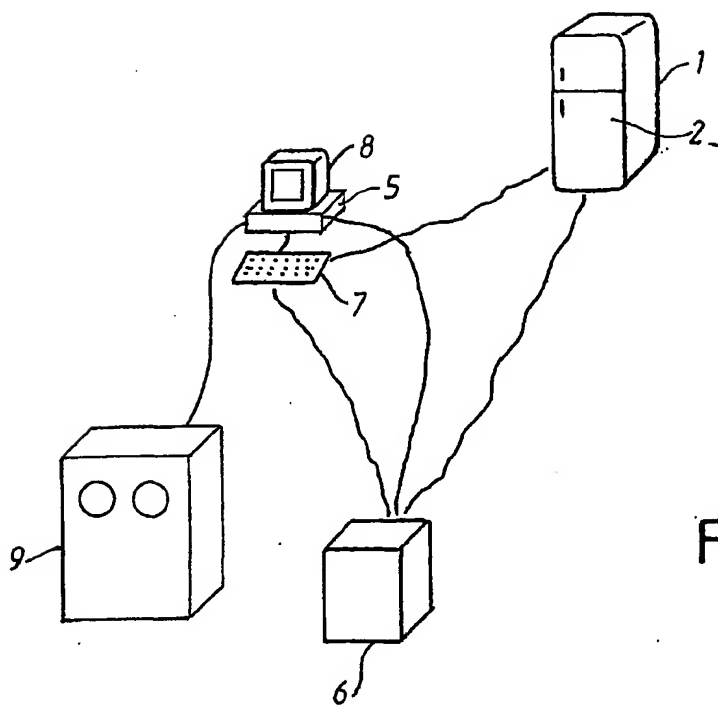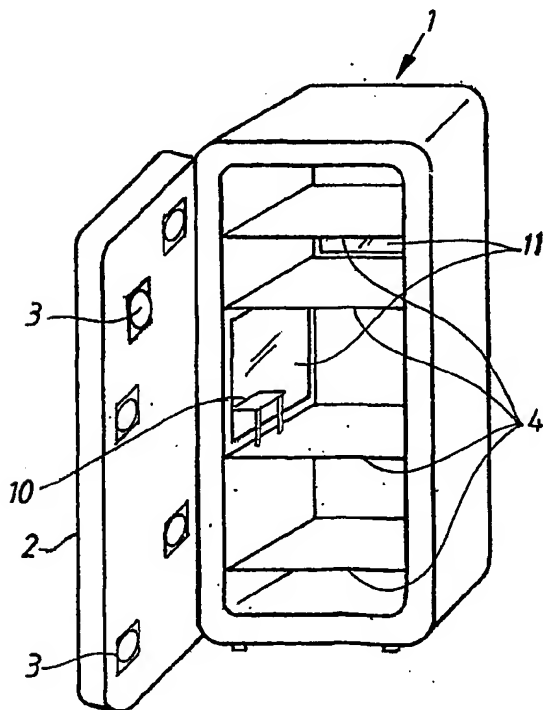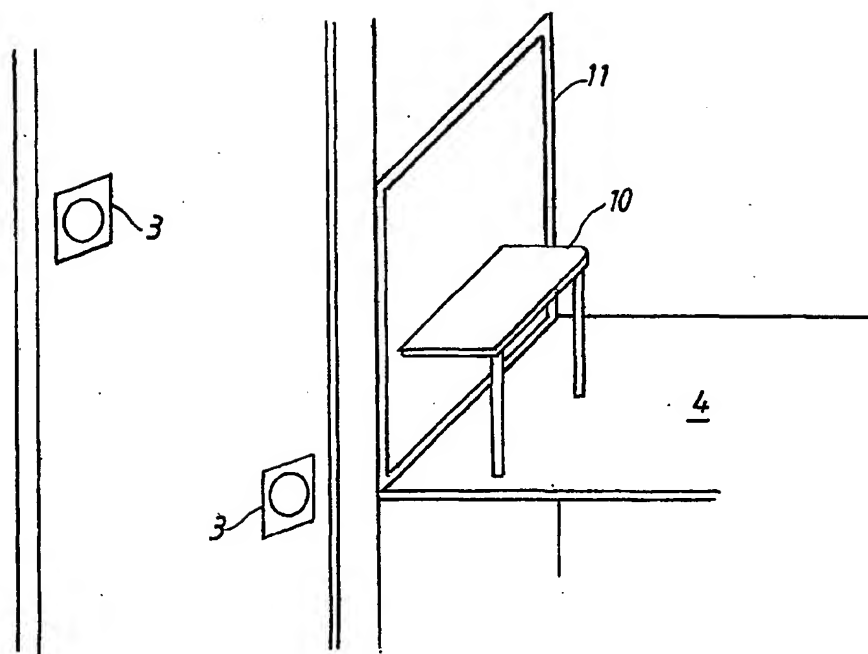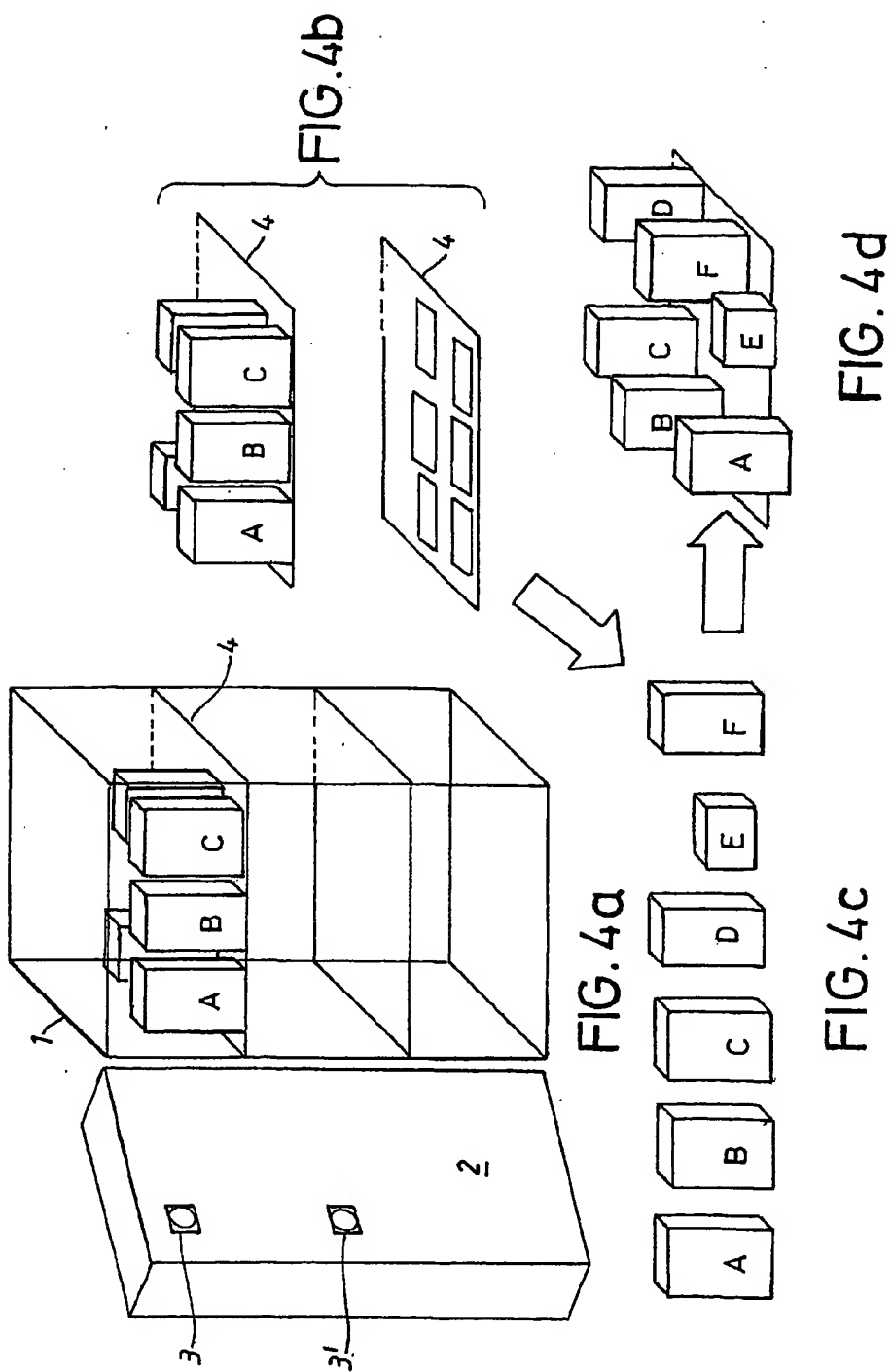35 or several weight sensors.

FIG.1

FIG. 2

FIG. 3

FIG. 4b

FIG. 4a

FIG. 4c

FIG. 4d

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 17/60, F25D 23/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F, G06T, F25D, G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO-INTERNAL, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
&X	Patent Abstracts of Japan, abstract of JP 10-9753 A (MATSUSHITA REFRIG CO LTD), 16 January 1998 (16.01.98), see paragraphs[0007]; [00123] – [00143]; [0033]; [0036] – [0037];[0043] – [0045]; [0062] – [0045]; [0062]; [0068]; claims 1-6; abstract	1,2,7,10,12, 16
&Y		4
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Y	FR 2785698 A1 (DEL RABAL, J.P. ET AL.), 12 May 2000 (12.05.00), page 4, line 9 – line 23, claims 5,9, abstract	4
	--	

☒ Further documents are listed in the continuation of Box C.	☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 November 2001	2 7 -11- 2001

Name and mailing address of the ISA/	Authorized officer
Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Bo Gustavsson/LR Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Patent Abstracts of Japan, abstract of JP 8-49958 A (KUSUNO, K. ET AL.), 20 February 1996 (20.02.96), abstract	1-17
	--	
A	WO 9750045 A1 (HARTSTEIN, S.), 31 December 1997 (31.12.97), page 10, line 7 - line 34, claims 8-11, abstract	11
	--	
P,A	US 6204763 A (SONE,M.), 20 March 2001 (20.03.01), column 2, line 50 - line 55; column 3, line 7 - line 15; column 3, line 44 - line 55, column 4, line 25 - line 33; column 8, line 20 - line 23; figure 1 and abstract	1-17
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P,A	EP 1030521 A1 (AKTIEBOLAGET ELECTROLUX (PUBL)), 23 August 2000 (23.08.00), abstract, the whole document	1-17
	--	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE01/01722

Box I	Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
   because they relate to parts of the international application that do not comply with the prescribed requirements to such
   an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II	Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all
   searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment
   of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report
   covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is
   restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest   ☐ The additional search fees were accompanied by the applicant's protest.

                       ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (1)) (July 1998)

The present claims are considered to involve three independent inventions á posteriori (see below). The inventions are described in the following groups of claims:

i)   A first invention emanating from claim 2 including claims 3-9 and 13-15, relating to a method of identifying and keeping track of the freshness of food stored in a refrigerator.

ii) A second invention defined in claim 11, relating to a device that can display recipes containing food that is about to spoil.

iii) A third invention according to claim 17, relating to adding weight sensors to one or more refrigerator shelves.

The prior art as described in JP10009753 shows that the technical features appearing in claims 1, 10, and 12 are well known to the skilled person. Therefore, there are no special technical features as defined in Rule 13.2 in common to the first, second and third inventions as described above. Consequently, unity of invention is lacking in the meaning of PCT Rule 13.1.

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
FR	2785698 A1	12/05/00	NONE		
WO	9750045 A1	31/12/97	AU	3406597 A	14/01/98
US	6204763 A	20/03/01	JP	2000296904 A	24/10/00
EP	1030521 A1	23/08/00	AU	1752700 A	24/08/00
			AU	4066299 A	01/11/99
			EP	1071457 A	31/01/01
			JP	2000244906 A	08/09/00
			SE	9900582 A	20/08/00